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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/851,313	05/09/2001	Tatsuya Usami	NEC01P069-MSb	2820

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EXAMINER

MALDONADO, JULIO J

ART UNIT	PAPER NUMBER
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2823

DATE MAILED: 08/01/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/851,313

Applicant(s)

USAMI, TATSUYA

Examiner

Julio J. Maldonado

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 5/13/2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-8 and 31-42 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 31-42 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 30 August 2002 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 05/13/2003 has been entered.

### ***Specification***

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 38 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim recite, "The semiconductor device according to claim 38...". This recitation renders the claim indefinite, since the claim depends on itself. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1, 3-5, 7, 8, 34-38, 41 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoi (U.S. 6,333,257 B1) in view of Jeng (U.S. 6,054,769).

Aoi (Figs.1A-3C) teaches a multi-layered insulation film formed on a semiconductor substrate comprising a first insulation layer (103); a second insulation layer (104) formed on and adhering to a top of said first insulation layer (103); a third insulation layer (105) formed on and adhering to a top of said second insulation layer (104); and a plurality of wires (111) formed in said multi-layered insulation film, wherein said multi-layered insulation film being disposed between said wires (111) and wherein said wires comprises copper, wherein said first insulation layer (103) has a thickness greater than a thickness of said second insulation layer (104), and wherein said first insulation layer (102) has a thickness greater than a thickness of said third insulation layer (105) (Aoi, column 7, line 64 – column 8, line 7). (column 7, line 54 – column 9, line 10).

Aoi fails to teach the first insulation layer comprising an organic material having a dielectric constant which is lower than a silicon oxide dielectric constant; the second insulation layer comprises at least one of hydrogen silsesquioxane and a hydride organosiloxane; the third insulation layer selected from a group consisting of silicon oxide, silicon nitride and silicon oxynitride. However, Jeng (1-3e) teaches a low dielectric multilayered film comprising a first insulation layer (18) comprising an organic material having a dielectric constant which is lower than a silicon oxide dielectric

constant; a second insulation layer (20) comprising a first layer and a second layer placed in said first layer, formed on and adhering to a top of said first insulation layer (18); a third insulation layer (22) formed on and adhering to a top of said second insulation layer (20), wherein the second insulation (20) layer comprises at least one of hydrogen silsesquioxane and a hydride organosiloxane, and the third insulation layer (22) selected from a group consisting of silicon oxide, silicon nitride and silicon oxynitride (column 3, line 49 – column 6, line 55). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Aoi and Jeng to enable using a multi-layered dielectric film as taught by Jeng, and furthermore since this would reduce cross talk between metal lines (column 1, line 52 – column 2, line 8) and improve mechanical strength, dimensional stability, high moisture absorption and permeation (column 2, lines 17 – 25).

7. Claims 2, 6, and 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoi ('257 B1) in view of Jeng ('769) as applied to claims 1, 3-5, 7, 8, 34-38, 41 and 42 above, and further in view of the applicants' admitted prior art in the instant application.

The combined teachings of Aoi and Jeng substantially teach all aspects of the invention but fails to show that the first insulation layer comprises an alkyl silsesquioxane having a dielectric constant of no greater than 3.5. However, the prior art (Figs.6a-c) teaches a first insulation layer (2) comprising an alkyl silsesquioxane having a dielectric constant of no greater than 3.5 (page 1, line 12 – page 6, line 13). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the

invention was made to use an alkyl silsesquioxane as taught by the prior art in the interconnect structure of Aoi and Jeng, since this would decrease inter-wire capacity (page 1, line 12-15).

8. Claims 39 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoi ('257 B1) in view of Jeng ('769) as applied to claims 1, 3-5, 7, 8, 34-38, 41 and 42 above, and further in view of Allada et al. (U.S. 6,218,317 B1).

The combined teachings of Aoi and Jeng teach a second insulation comprising hydrogen silsesquioxane, but fails to teach using a methylated hydrogen silsesquioxane film (MHSQ) at a thickness of about 50nm. However, Allada et al. (Figs.1a-1b) in a related art to the formation of an interconnect structure teach a second insulating film comprising a methylated hydrido organo siloxane polymer (column 2, lines 7 – 58). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to use the insulating layer as taught by Allada et al. in the interconnect formation structure of Aoi and Jeng, since this dielectric layers exhibit low dielectric constants (column 2, lines 36-48).

Still, the combined structure of Jeng and Allada fail to teach the dielectric layer having a thickness of about 50nm. Notwithstanding, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular dimensions because applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension.

Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

### ***Response to Arguments***

9. Applicant's arguments with respect to claims 1-8 and 31-42 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

10. Papers related to this application may be submitted directly to Art Unit 2823 by facsimile transmission. Papers should be faxed to Art Unit 2823 via the Art Unit 2823 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2823 Fax Center number is **(703) 305-3432**. The Art Unit 2823 Fax Center is to be used only for papers related to Art Unit 2823 applications.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Julio J. Maldonado** at **(703) 306-0098** and between the hours of 8:00 AM to 4:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via [julio.maldonado@uspto.gov](mailto:julio.maldonado@uspto.gov). If attempts to reach the examiner by telephone


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are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (703) 306-2794.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Group 2800 Receptionist** at **(703) 308-0956**.



JMR  
7/23/03



George Fourson  
Primary Examiner